CLAIMS

1. Optical device (1) for the differentiation of two optical signals, a first signal and a second signal, the second signal being the same as the first signal but lagging behind it by a delay τ comprising:

- two channels (5, 6), a first channel (5) and a second channel (6), each of these channels comprising a first medium (10) and a second medium (11), the optical indexes of each of these media varying with a characteristic of an optical signal passing through them,
- means (2) of generating a continuous wave,
- means (8) of making a signal present on the first channel (5) interfere with a signal present on the second channel (6), an output signal from these interference means (8) forming the difference signal between the first and the second signal.
- means (4) of inputting the continuous wave on each of the two channels,

the device being characterised in that the first channel (5) also comprises:

- a delay means (7) placed in series with the first medium (10), for which the optical index varies with a characteristic of the signal passing through it, and
- a means (3) of inputting the first signal on each of the channels, the input onto the first channel taking place on the input side of the series formed by the first medium (10) and the delay means (7).

2. Device according to claim 1, characterised in that an output from the means (4, 13) of inputting the continuous wave onto the first channel is located on the output side of the delay means (7) τ.

3. Device according to claim 1, characterised in that an output from the means (4, 13) of inputting the continuous wave onto the first channel is located on the input side of the delay means (7) τ.

4. Device according to claim 3, characterised in that the means of inputting the first signal onto the first channel and onto the second channel comprise a multimode interferometric input structure (13) with two inputs (14, 15), a first input (14) and a second input (15) and two outputs (16, 17), a first output (16) and a second output (17), the first signal being applied to the first input (14) and the continuous wave being applied to the second input (15), the first output (16) being coupled to the first channel (5) and the second output (17) being coupled to the second channel (6).

5. Device according to either of claims 3 or 4, characterised in that the means (8) of making signals output from the first channel (5) and the second channel (6) interfere, comprise a multimode interferometric output structure (18) with two inputs (19, 20), a first input (19) and a second input (20), and an output (21), the first input (19) being coupled to the first channel (5), the second input (20) being coupled to the second channel (6), the output from this multimode interferometric output structure (18) forming the output (21) carrying the difference signal.

6. Device according to any one of claims 1 to 5, characterised in that it comprises means (9) of adjusting the optical propagation index of a medium with an index that varies with the optical power of the optical signal passing through the said medium, the said means acting on the medium (10, 11) with a variable index in at least one of the channels (5, 6).

7. Device according to claim 6, characterised in that the first medium (10) and second medium (11) with an optical refraction index that varies as a function of the optical power passing through it, are optical semiconductor amplifiers, the means (9) of adjusting the optical index being composed of means of varying the value of a polarisation current of at least one of the said amplifiers (10, 11).

8. Device according to claim 7, characterised in that it also comprises detection means (22) on the output side of the output (21) carrying the difference signal, to detect the optical power of the difference signal, an electric signal present at the output of these means being coupled and fed back onto the means (9) of adjusting the polarization current of at least one of the optical amplifiers (10, 11) in order to minimize the value of this electric signal.

9. Device according to claim 1, characterised in that the first signal is a digital data signal with one bit duration, and that the means (7) of introducing a delay τ introduces a delay with a duration between about 7 picoseconds and the bit duration.

10. Device according to claim 9, characterised in that the delay duration introduced by the means (7) of introducing a delay τ is about 7 picoseconds.

11. Device (30) for reconstitution of a clock signal of an optical data transmission signal, characterised in that it comprises an optical device (1) for differentiation of two optical signals according to one of claims 1 to 8, and triggered optical self-oscillating means (31) located on the output side of the optical differentiation device (1) for two optical signals, the difference signal from the optical device for differentiation of the two optical signals being applied to these self-oscillating optical means, and outputting the reconstituted clock signal, the first signal in this case being the optical transmission signal.

12. Device (30) for reconstitution of a clock signal of an optical data transmission signal according to claim 9, characterised in that the self-oscillating optical means (31) comprise a self-oscillating laser diode.

13. Use of an optical differentiation device (1) for two optical signals according to one of claims 1 to 8, to create a clock signal with a frequency equal to twice the frequency of a first clock signal.